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A.D. 1868, 11th May. N<sup>o</sup> 1536.

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S P E C I F I C A T I O N

OF

CLINTON EDGCUMBE BROOMAN.

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SMOKE-CONSUMING FURNACES.

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LONDON:

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A.D. 1868, 11<sup>th</sup> MAY. N° 1536.  
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**Smoke-consuming Furnaces.**

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*(This Invention received Provisional Protection only.)*

**PROVISIONAL SPECIFICATION** left by Clinton Edgcumbe Brooman at the Office of the Commissioners of Patents, with his Petition, on the 11th May 1868.—A communication from abroad by Eugene Alexandre Frederic Goguel, of St. Etienne, France.

5 I, CLINTON EDGCUMBE BROOMAN, of the Firm of Robertson, Brooman, and Company, of 166, Fleet Street, in the City of London, Patent Agents, do hereby declare the nature of the said Invention for “**IMPROVEMENTS IN FURNACES OR HEATING APPARATUS,**” to be as follows:—

10 The object of this Invention is the construction of smoke-consuming gasogeneous apparatus which will transform solid combustible matters into combustible gases, and thus satisfy in an industrial point of view all that is required of a powerful and smoke-consuming heating apparatus.

15 The essential features which characterize this apparatus or furnace are:—1st, complete and successive reduction of the fuel in the same apparatus without interruption of heat in several communicating fire-places; 2ndly, ascent and descent of the gases arising from the first combustion or injection of steam or water into the channels which lead these gases from one fire-place to another, or even the draught or suction



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*Brooman's Improvements in Smoke-consuming Furnaces.*

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of a blowing apparatus as means of increasing their draught, of increasing their pressure, of producing hydrogens by the decomposition of this steam or water, and of facilitating the leading of the gases from one point to another and of directing them with a certain pressure out of this apparatus; 3rdly, the hermetic and almost continuous mode of charging 5 owing to the reduced volume of the charge; 4thly, the complete enrichment of the gases developed in all the parts of the apparatus by causing the gases to return into the apparatus which has generated them, in order that they may not issue therefrom until they have been enriched therein through a layer of incandescent fuel; 5thly, the 10 simple and economical mode of heating the new air for burning the combustible gases in a special combustion chamber; and, 6thly, a combustion chamber, one of the sides or walls of which is formed with holes by which the burnt gases pass as through a sieve in order to enter the apparatus to be heated. 15

I proceed to describe a furnace or apparatus constructed according to this Invention. Boxes for charging the fuel slide on perforated plates, and the fuel falls down tubes upon the bars of the first fire-place. These bars are preferably arranged stepwise or as shelves. This fire-place has hollow fire-bridges formed with small holes. The fuel is lighted on 20 the bars of the first place, and its distillation effected. The greater part of the gaseous products of this distillation passes over the fire-bridges, impinges against the under side of fresh air tubes hereafter referred to, and passes down vertical channels leading to arched openings or passages; these openings or passages conduct the gaseous products 25 into the incandescent fuel on the grate bars of a second fire-place below the first, so that the products become enriched. The other part of the products passes direct to the second fire-place. Superheated steam supplied to the hollow fire-bridges escapes by the small holes therein, and favors the passage of the gaseous products down the vertical channels from the 30 first to the second fire-place in which this dry steam is decomposed, and in which the gases and vapors become saturated with carbon in order to supply to the combustion chamber hereafter referred to only very combustible gases. Fresh air for burning the gases in the combustion chamber is forced or drawn through the fresh air pipes before mentioned. 35 These pipes are at the upper part of the apparatus, and the air admitted by them passes down a vertical space in one of the walls. The air is thus heated and afterwards mixes with the gases at the lower part of



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*Brooman's Improvements in Smoke-consuming Furnaces.*

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the vertical space or passes through openings leading to the combustion chamber. The amount of air admitted may be regulated by closing more or less the entrances of the air tubes or by other means. It is therefore in this combustion chamber that the gases are burnt by the  
5 fresh air; they cannot fail to be completely burnt after having traversed an openworked partition, which is situated between the combustion chamber and the apparatus or boiler flue to be heated. In the interior of the boiler flue several openworked partitions may be arranged; these partitions may be placed at certain intervals and the openings would  
10 be opposed to each other so as to impede as required the travel of the heating gases. The furnace or gasogeneous apparatus is thus based on the principle that instead of effecting the complete reduction of the fuel in one fire-place or at one point, I effect it at different points without interruption of heat in communicating fire-places, that is to say, that  
15 in the first fire-place I cause this fuel to undergo a first combustion in order afterwards to complete the combustion at one or several other points, either by means of grate bars and tuyeres or by forced draught of air or steam, superheated or not. Based on this principle of lighting a combustible matter a first time in order to convert its volatile com-  
20 ponents into gas, to afterwards finish the reduction of the same fuel at one or several other points, or one or several other fire-places of the apparatus with the view of completely extracting the gases from the solid part, and of enriching through this ignited fuel the gases produced by the first combustion and those developed in the second combustion.

25 The apparatus may be variously modified in form, dimensions, constitutive parts, and the materials employed for its construction. In some forms of apparatus the gases are caused to impinge upon the surface of water in their passage from the first to the second fire-place.

The following arrangement of a gasogeneous apparatus should  
30 however be described, by which combustible gases are produced by suction or exhaustion of air through the grate bars, and as required through openings formed in the walls or sides of the furnace, and by which these gases are lighted with pressure by a jet of air drawn by superheated steam. The fuel is fed into a first compartment; the steam  
35 and noncombustible gases pass through the incandescent fuel and become enriched therein before entering a second compartment. Now between the two compartments a cast-iron block or lump is fitted formed lengthwise with several holes, channels, or passages, some allowing



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*Brooman's Improvements in Smoke-consuming Furnaces.*

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passage to steam and others allowing passage to atmospheric air; this block serves to superheat the steam and the air separately. The mixture of superheated steam and superheated air passing through the tubular block cannot take place except on issuing from the block; this mixture in leaving the block draws the combustible gases engendered in the two 5 compartments before mentioned; the inflamed product then comes in contact with or licks the boiler under conditions more favorable to the utilization of the caloric than by ordinary fire-places.

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